BS EN 12312-1:2013

BSI Standards Publication

Aircraft ground support equipment — Specific requirements

Part 1: Passenger stairs

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National foreword

This British Standard is the UK implementation of EN 12312-1:2013. It supersedes BS EN 12312-1:2001+A1:2009 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee ACE/57, Air cargo and ground support equipment.

A list of organizations represented on this committee can be obtained on request to its secretary.

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This European Standard was approved by CEN on 24 November 2012.

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Foreword

This document (EN 12312-1:2013) has been prepared by Technical Committee CEN/TC 274 “Aircraft ground support equipment”, the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by July 2013, and conflicting national standards shall be withdrawn at the latest by July 2013.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 12312-1:2004+A1:2009.

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For relationship with EU Directive(s), see informative Annex ZA, which is an integral part of this document.

EN 12312, *Aircraft ground support equipment — Specific requirements*, consists of the following parts:

— *Part 1: Passenger stairs* (the present document);

— *Part 2: Catering vehicles*;

— *Part 3: Conveyor belt vehicles*;

— *Part 4: Passenger boarding bridges*;

— *Part 5: Aircraft fuelling equipment*;

— *Part 6: Deicers and deicing/anti-icing equipment*;

— *Part 7: Air-craft movement equipment*;

— *Part 8: Maintenance stairs and platforms*;

— *Part 9: Container/Pallet loaders*;

— *Part 10: Container/Pallet transfer transporters*;

— *Part 11: Container/Pallet dollies and loose load trailers*;

— *Part 12: Potable water service equipment*;

— *Part 13: Lavatory service equipment*;

— *Part 14: Disabled/incapacitated passenger boarding vehicles*;

— *Part 15: Baggage and equipment tractors*;

— *Part 16: Air start equipment*;

— *Part 17: Air conditioning equipment*;

— *Part 18: Nitrogen or Oxygen units*;

— *Part 19: Aircraft jacks, axle jacks and hydraulic tail stanchions*;

— *Part 20: Electrical ground power units*.

The main changes compared to the previous edition are:

a) Amendment A1:2009 was incorporated;

b) the Introduction was updated;

c) the Scope was updated;

d) Clause 2, Normative references, was updated;

e) another term and definition was added;

f) List of hazards was moved to Annex A;

g) 5.1 was changed;

h) 5.2, Safeguards against falling, was inserted, thus making it necessary to re-number the following sub-clauses;

i) 5.3 to 5.10 were changed;

j) 6.2 and 6.3 were changed;

k) 7.1 was changed;

l) 7.2, Guard rails, 7.3, Barrier and 7.4, Platforms and steps, were inserted;

m) Annex A, Examples of passenger stairs, was deleted;

n) Annex ZA referring to the Machinery directive 98/37/EC was replaced by Annex ZA referring to the new Machinery directive 2006/42/EC;

o) the Bibliography was updated.

According to the CEN/CENELEC Internal Regulations, the national standards organisations of the following countries are bound to implement this European Standard: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, Former Yugoslav Republic of Macedonia, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.

Introduction

This European Standard defines health and safety requirements, for stairs including a built-in source of power (see Clause 1, Scope) intended for passengers embarking/disembarking aircraft.

The minimum essential criteria are considered to be of primary importance in providing safe, serviceable, economical, and practical passenger stairs. Deviations should occur only after careful consideration, extensive testing, risk assessment and service evaluation have shown alternative methods or conditions to be satisfactory. Such deviations are outside the scope of this standard and a manufacturer should be able to demonstrate an equivalent level of protection.

This European standard is a Type C standard as defined in EN ISO 12100.

The machinery concerned and the extent to which hazards, hazardous situations and hazardous events are covered are indicated in the scope of this document.

When provisions of this Type C standard are different from those which are stated in Type A or B standards, the provisions of this Type C standard take precedence over the provisions of the other standards, for machines that have been designed and built according to the provisions of this Type C standard. Deviations from requirements do not fall within the presumption of conformity given by the standard.

1 Scope

This European Standard specifies the technical requirements to minimise the hazards listed in Clause 4 which can arise during the commissioning, the operation and the maintenance of passenger stairs when used as intended, including misuse reasonably foreseeable by the manufacturer, when carried out in accordance with the specifications given by the manufacturer or his authorised representative. It also takes into account some requirements recognised as essential by authorities, aircraft and ground support equipment (GSE) manufacturers as well as airlines and handling agencies.

This European Standard applies to:

a) self-propelled stairs with seated driver;

b) pedestrian controlled stairs;

c) towable stairs equipped with powered means, e.g. for height adjustment, stabilisers;

d) automatic levelling systems of stairs

for embarking/disembarking of passengers.

"Powered" should also be understood as manual effort stored in springs or hydraulic accumulators, etc., the dangerous action of which can be produced or can continue after the manual effort has ceased or directly applied manual effort for lifting or lowering loads.

Those clauses of this standard that can apply may also be used as a guideline for the design of towable stairs without powered means.

This European Standard does not establish additional requirements for the following:

1) persons falling out of an aircraft with the passenger stairs not in position;

2) hazards resulting from a moving stairway (escalator);

3) upper deck door access.

This part of EN 12312 is not applicable to passenger stairs which are manufactured before the date of publication of this standard by CEN.

This part of EN 12312 when used in conjunction with EN 1915-1, EN 1915-2, EN 1915-3 and EN 1915-4 provides the requirements for passenger stairs.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 1175-1, *Safety of industrial trucks — Electrical requirements — Part 1: General requirements for battery powered trucks*

EN 1837, *Safety of machinery — Integral lighting of machines*

EN 1915-1:2013, *Aircraft ground support equipment — General requirements — Part 1: Basic safety requirements*

EN 1915-2:2001+A1:2009, *Aircraft ground support equipment — General requirements — Part 2: Stability and strength requirements, calculations and test methods*

EN 1915-3, *Aircraft ground support equipment — General requirements — Part 3: Vibration measurement methods and reduction*

EN 1915-4, *Aircraft ground support equipment — General requirements — Part 4: Noise measurement methods and reduction*

EN ISO 12100:2010, *Safety of machinery — General principles for design — Risk assessment and risk reduction (ISO 12100:2010)*

EN ISO 13849-1:2008, *Safety of machinery — Safety-related parts of control systems — Part 1: General principles for design (ISO 13849-1:2006)*

EN ISO 13850:2008, *Safety of machinery — Emergency stop — Principles for design (ISO 13850:2006)*

EN ISO 14122-3:2001, *Safety of machinery — Permanent means of access to machinery — Part 3: Stairs, stepladders and guard rails (ISO 14122-3:2001)*

ISO 7718-1:2009, *Aircraft — Passenger doors interface requirements for connection of passenger boarding bridge — Part 1: Main deck doors*

ISO 16004, *Aircraft ground equipment — Passenger boarding bridge or transfer vehicle — Requirements for interface with aircraft doors*

DIN 51130:2004, *Testing of floor coverings — Determination of the anti-slip property — Workrooms and fields of activities with slip danger, walking method — Ramp test*

3 Terms and definitions

For the purposes of this document, the terms and definitions given in EN 1915-1:2013, EN ISO 12100:2010 and ISO 7718-1:2009 and the following apply.

3.1
passenger stair
stair designed for the embarking and disembarking of passengers between the aircraft and the ground

3.2
stair flight
series of steps between ground level and platform or between two platforms

3.3
riser height
R
distance between the surface of the tread of one step and the surface of a step above or below when measured perpendicularly between the tread surfaces

3.4
tread depth
T
distance from one step nosing to the adjacent step nosing when measured parallel to the tread surface

3.5
step width
maximum usable width measured along the nose of the step

3.6
handrail height
distance to the top surface of the handrail as measured at the nose of the step or platform and perpendicular to the tread surface

3.7
upper (main) platform
platform at the upper end of a stair flight with access to the aircraft

3.8
intermediate platform
platform between two stair flights

3.9
incline
angle of stair flight to a horizontal plane, measured across the noses of the steps

3.10
inclination
angle of the platforms and steps surfaces to a horizontal plane, measured at a right angle to the noses of the steps

3.11
bottom hinged step
foldable step at the bottom end of the stair to provide sufficient ground clearance during movement

3.12
leading edge
front end of the upper (main) platform at the aircraft door interface

3.13
auxiliary system
independent system for the operation of the passenger stair in case of power loss

3.14
barrier
movable element to prevent access into the area

4 List of hazards

The list of risks and hazards (given at Annex A) is based on EN ISO 12100:2010 and contains the hazards and hazardous situations, as far as they are dealt with in this European Standard, identified by risk assessment as significant for passenger stairs and which require action to eliminate or reduce risks. Not covered are hazards due to a standard automotive chassis, the traffic and repair.

5 Safety requirements and/or measures

5.1 General requirements

5.1.1 Passenger stairs shall conform to the requirements of this standard and relevant requirements of EN 1915-1, EN 1915-2, EN 1915-3 and EN 1915-4 unless otherwise specified in this standard. The specific requirements of this standard take precedence over those of the EN 1915 series.

5.1.2 Stability and strength calculations shall be carried out in accordance with EN 1915-2.

5.1.3 For stairs to be moved on public roadways, the dimensions, laden mass and other characteristics shall meet all applicable government regulations when in fully retracted position.

NOTE Applicable government regulations depend on the airport of use.

5.1.4 Passenger stairs shall have an upper (main) platform and, where the number of risers exceeds 18, an intermediate platform shall be provided at least after every 18 risers. The number of risers shall not normally exceed 40.

5.1.5 Step and platform inclination in all intended operating positions shall not exceed ± 3° (5 %) when the passenger stair rests on a horizontal plane.

5.1.6 The step and platform cover material shall provide the possibility of easy elimination of water and snow, and be selected to minimise wear. The flooring materials shall also provide a durable slip-resistant surface, with a minimum R11 slip-resistance classification.

Slip resistance classification shall be measured in accordance with DIN 51130:2004, Table 3.

5.1.7 With the passenger stair fully stowed for movement, the lowest point of any part of the passenger stair shall not be less than 150 mm above a horizontal ground surface. In addition, the clearance shall allow without interference the traversing of two surfaces intersecting at an angle of 3° (5 %) either in bridging or in cresting.

5.1.8 The driver's accommodation shall not project forward of the leading edge of the upper (main) platform when in its fully retracted position. The passenger stair shall be constructed so that the driver is able to see the leading edge throughout its operating range.

5.1.9 Where an operator's workplace is provided on the upper (main) platform, the following requirements shall apply:

a) the workplace shall be entirely protected against the risk of falling in accordance with 5.2;

b) standing operation shall be limited to a travelling speed of 15 km/h. The minimum free space for standing operation shall be 600 mm wide by 500 mm deep. A rest pad shall be provided for a standing driver;

c) the operator's position shall provide an unobstructed view of the platform's leading edge and the full flight of stairs.

5.1.10 Stair flights and platforms shall have illumination of a non-glare quality for floor and step treads. A minimum illumination of 50 lx shall be provided, as measured at the centre line of the stair flight and platforms, parallel to and on the tread surface.

5.1.11 The electrical system of battery powered passenger stairs shall conform to EN 1175-1.

5.1.12 The driver accommodation of self-propelled passenger stairs shall be equipped with a restraint system for the driver.

5.1.13 Pedestrian controlled or towable stairs shall be fitted with a service and parking brake function that can be engaged and released at the operator's workplace or at the towbar head.

5.1.14 The minimum field of view from the driver's position shall include the ground area immediately aft of the unit up to the first steps. This can be achieved either by using see-through risers on the stair flight, or indirect means such as e.g. mirrors or closed circuit TV. It is further recommended to consider providing indirect means for seeing the stairs upper platform from the driver's position.

5.2 Safeguards against falling

5.2.1 Provisions shall be made for eliminating or reducing the risk of falling of persons from the front edge of the stairs' upper platform when the stair is not completely connected to the aircraft or is being removed.

Such provisions shall consist of:

a) for passenger stairs with a maximum height of the upper (main) platform from 1 000 mm up to 2 000 mm: one barrier at the upper (main) platform of the passenger stairs;

b) for passenger stairs with a maximum height of the upper (main) platform in excess of 2 000 mm: two barriers, one at the bottom end of the passenger stairs, one at the upper (main) platform.

5.2.2 Upper (main) platform barriers shall:

a) consist of an upper element with a height of at least 1 100 mm and at least one intermediate element 500 mm below the upper element;

b) use additional elements as necessary to prevent the free vertical height between adjacent elements exceeding 500 mm;

c) be designed so that when in the position giving protection they have a maximum deflection not exceeding at any point 5% of the unsupported span when subjected to an horizontal load F of 1 000 N at the most unfavourable location, without causing any permanent deformation. See 7.3 for verification;

d) be clearly visible from either side, including at night and in fog;

e) be padded to avoid any damage where it may interfere with open aircraft doors or doors being opened;

NOTE Recommended practices for aircraft protective padding are contained in SAE AIR 1558; see Bibliography.

f) be sufficiently movable for safe person transfer when the platform is in position against the aircraft. Movable sections shall be easy to handle by one person with a force not exceeding 62 N, and able to be stowed safely, i.e. retained in the stowed position by a positive fit device requiring deliberate action for release.

5.2.3 Bottom end barriers shall at least consist of a strap, e.g. a strap with an inertia reel, and a device for securing the strap in the "stair-closed" position.

5.2.4 On self-propelled stairs, stabilisers retraction or backward movement of the stairs shall be prevented unless the barriers are in their protective position. The related interlocking systems shall achieve performance level "c" according to EN ISO 13849-1:2008.

5.2.5 To warn of impending stairs removal, the stair shall be equipped with both an audible warning (intermittent single-frequency tone in accordance with EN 1915-1:2013, 5.12 and a flashing red light highly unmistakable from the aircraft doorway under all circumstances. These signals shall be activated automatically at least 5 s before the stair can be removed, or by the start of the stabilisers retraction, and shall remain active during the complete backward movement.

Where possible, the design of the stair may prevent its removal before the aircraft door is closed.

5.3 Stair flight

5.3.1 All steps of a stair flight shall be designed with the same riser height and the same tread depth.

5.3.2 Riser height and tread depth dimensions shall meet the following geometry criteria:

Riser height (R) + Tread depth (T) = 460 mm ± 10 mm

The riser height (R) shall be between 140 mm and 210 mm, the tread depth (T) shall be between 250 mm and 320 mm.

5.3.3 The incline for the stair flight when set for embarking/disembarking shall be between 24° and 40°.

NOTE The optimum angle for the stair flight incline is between 30° and 38°.

5.3.4 The minimum usable clear width of a stair flight shall be 1 000 mm; see 5.9.2 for minimum headroom required where a canopy is installed.

5.3.5 Any hinged step that may be fitted at the bottom of the stair shall meet the criteria in 5.1.7 and 5.3.1. This step shall be easy to handle and be able to be stowed safely.

5.3.6 The distance from the ground to the tread surface of the bottom step shall not exceed 260 mm, when the stair is positioned on a horizontal supporting surface and set for embarking/disembarking.

5.3.7 Each step shall withstand the following unfactored loads:

a) if the steps width is less than 1 200 mm, then 1 500 N shall be distributed over a 100 mm × 100 mm area at the leading edge of the step and in the middle of the stair's width,

b) if the steps width is equal to or greater than 1 200 mm, then 1 500 N shall be distributed over each of two 100 mm × 100 mm areas at the leading edge of the step, applied at the most unfavourable points and spaced 800 mm.

In either case, the total measured elastic deflection shall not exceed 1/200th of the step's span. There shall be no permanent deformation.

5.4 Platforms

5.4.1 The upper (main) platform shall have a minimum usable length of 1 200 mm. Where allowed by the local airport regulations regarding vehicles overall width (see EN 1915-1:2013, Introduction, f) - negotiation), the minimum clear width dimension between the inner faces of guard rails/side panels should be equal to the cumulative widths of the aircraft door in the open and closed positions plus a 200 mm minimum clearance, in order to allow full door opening and closing while remaining within the boundaries of guard rails/side panels.

NOTE See 6.3, Instructions for use, for listing by the manufacturer of the aircraft types and doors the stairs are intended to serve.

5.4.2 The leading edge of the upper (main) platform shall be designed in a manner that provides a good fit to the aircraft fuselage, i.e. a maximum gap of 100 mm along the length of the interface. Bumpers made of flexible material shall allow direct contact between leading edge and aircraft fuselage.

The leading edge of the platform shall be fitted along its whole length with a full width bumper designed to protect the aircraft that:

a) is of a non-marking semi-soft material;

b) ensures a minimum 60 mm crushing capability;

c) is designed to minimise any force exerted onto the aircraft doorframe.

It is recommended the static force equivalent does not exceed 1 500 N distributed over the length, or 1 500 N on any 100 mm x 100 mm contact area.

The aircraft interface device may include a contact detection feature able to provide an electrical signal when contact with the aircraft is achieved at any point that can be used to stop movement. In this case, the related interlocking systems shall achieve performance level "b" according to EN ISO 13849-1:2008.

5.4.3 Both sides of the upper (main) platform shall be fitted with full panels supporting the handrails as per 5.5. The forward end of each side panel shall be covered by protective padding and be of such design to leave a maximum gap of 120 mm to the aircraft fuselage.

Both side panel edges shall be fitted along their whole height with an aircraft protection device that:

a) is of a non-marking semi-soft material;

b) ensures a minimum 60 mm crushing capability;

c) is designed to minimise any force exerted onto the aircraft doorframe.

It is recommended the static force equivalent does not exceed 1 500 N distributed over the length, or 1 500 N on any 100 mm x 100 mm contact area.

The aircraft interface device may include a contact detection feature able to provide an electrical signal when contact with the aircraft is achieved at any point that can be used to stop movement. In this case, the related interlocking systems shall achieve performance level "b" according to EN ISO 13849-1:2008.

5.4.4 Where the platform internal usable width is less than defined in 5.4.1, one or both guard rails/side panels together with their handrails shall be adjustable in order to allow safe opening and closing of the aircraft doors without obstruction.

NOTE See 6.3, Instructions, for listing by the manufacturer of the aircraft types/sub-types and doors the stairs are intended to serve.

It shall be possible to actuate the movable panel(s) and open/close the aircraft door from a protected position, i.e. one that provides continuous flooring and full enclosure by guard rails.

The force required for the actuation of movable parts shall not exceed 62 N.

5.4.5 The leading edge of the upper (main) platform and side panels, as well as any appurtenances located in or close to the critical interference area shall conform with the interface requirements given in ISO 7718-1 and ISO 16004.

5.4.6 The length of any intermediate platform shall be three treads minimum. Any longer platform shall have a depth equal to that of the tread multiplied by an integer.

5.4.7 The strength of the upper (main) platform and any intermediate platform (landing) shall be determined in accordance with EN 1915-2:2001+A1:2009, 5.2.2.3. There shall be no permanent deformation of the platform(s) under the specified unfactored loads.

In addition to the requirements of EN 1915-2:2001+A1:2009, 5.2.2.3, the deflection of the flooring shall not exceed 1/200th of the span, and the difference between the loaded and a neighbouring flooring shall not exceed 5 mm in height, when an unfactored load of 800 N is distributed over an area of 200 mm $\times$ 200 mm at the most unfavourable position on the platform's floor.

5.5 Guard rails

5.5.1 Guard rails or hand rails with side panels, conforming to EN 1915-1:2013, 5.13, shall be provided on both sides of the stair flight, the intermediate platform and the upper (main) platform.

5.5.2 Full continuity shall be maintained at all points between handrail segments. For overlapping handrail segments, the distance between segments placed side by side shall be more than 100 mm and less than 150 mm.

5.5.3 Handrails shall include no projection or corners that could cause injury. They shall be smooth including the underside. Open junctions are not allowed. Edges or corners shall be rounded with a minimum radius of 5 mm.

5.5.4 Handrails shall be easily replaceable and suitably finished to preclude the possibility of damaging or soiling of persons clothing.

5.5.5 Guard rails shall include full panels up to a height of 500 mm from the nose of the step. The maximum gap between handrail and panel shall be 450 mm.

Preferably, all panels should be full panels.

5.5.6 The guard rails or side panels minimum height shall be as follows:

a) Stair flight (measured vertically at nose of steps) 900 mm;

b) Platforms 1 100 mm.

5.5.7 Guard rails shall be designed so that they have a maximum deflection of 20 mm at any point when subjected to a horizontal outward load of $F = f \times$ maximum distance in metres, where f = 1 000 N/m (distributed load) along the whole handrail with the stair at maximum extension, without causing any permanent deformation. See 7.2 for verification.

5.6 Raising devices and stability

5.6.1 Stability calculations and testing shall be carried out in accordance with EN 1915-2.

5.6.2 Telescopic height adjustment shall be performed by increments of one full step. Adjustment to intermediate heights shall only be provided by either the incline of the stair flight or the indication of the platform (see 5.1.5).

5.6.3 Reliance on the extension/retraction system, as a safety device against unintentional lowering, shall not be considered acceptable. In order to provide a fail-safe operation, a positive acting device, e.g. ratchet/pawl device shall be incorporated to ensure that the adjusted elevation is maintained when the passenger stair is subjected to a payload.

5.6.4 Stabilisers in the retracted position shall not protrude from the passenger stair's overall width.

Preferably, the stabilisers in the operating position should not protrude either from the overall width.

The stabilisers of pedestrian controlled passenger stairs shall not protrude from the overall length within the operating range of the tiller or towbar.

5.7 Controls, monitoring devices and displays for self-propelled passenger stairs

5.7.1 For passenger stairs with joystick control, an armrest shall be provided for positioning (whether the operator is seated or standing).

5.7.2 Controls for extending and retracting the passenger stair as well as the upper (main) platform and the stabilisers shall be located at a position with adequate visibility under all operating conditions to the aircraft, the leading edge of the upper (main) platform, and the area around the stabilisers. Where necessary, indirect visibility aids, e.g. mirrors or CCTV, shall be provided.

5.7.3 Confirmation by a visible indication shall be provided adjacent to each stabiliser control, that all stabilisers are fully retracted or fully extended.

5.7.4 Emergency stops shall be provided at every operator control panel. Emergency stops shall meet the requirements of EN ISO 13850:2008, 4.1.4.

The emergency stop shall not de-activate the braking system of self-propelled stairs.

5.7.5 For the final approach to the aircraft, it shall be possible to position the passenger stair slowly without jerks and jolts.

5.7.6 Driving shall not be possible when any other function(s) relative to the movements of the stair flight and the platform is (are) activated.

5.7.7 A working light shall be provided for positioning the passenger stair to the aircraft door area for night operations. The design and installation of the light shall conform to EN 1837. The minimum luminous flux of the lamp shall be 250 lm.

5.8 Auxiliary means for powered passenger stairs

5.8.1 The passenger stair shall be fitted with auxiliary means:

a) to lower the upper (main) platform and the stair flight, and

b) to retract the stabilisers,

allowing the passenger stair to be towed away in the event of primary power loss.

5.8.2 The auxiliary means shall be independent from the primary e.g. hand pump or with an independent power source from the primary one. Its controls shall be located at ground level and accessible only by positive action.

5.9 Canopy

5.9.1 Where a canopy is installed it shall be fixed to the body of the passenger stair so that it is not removable without intentional human action.

5.9.2 The minimum vertical distance between the lowest point of the canopy roof and all passenger stair tread areas more than 300 mm from handrails shall not be less than 2 100 mm, for all other areas 1 800 mm.

5.9.3 The inner surface of the canopy shall include no projections or corners that could cause injury, e.g. corners shall be chamfered or rounded to a minimum radius of 3 mm unless smooth corners are provided by the intrinsic design of the standard material profiles used in the construction of the canopy.

5.9.4 The inner surface of the canopy shall be easily replaceable, e.g. by being fixed by screws or bolts, and suitably finished to preclude the possibility of damaging or soiling of persons clothing.

5.9.5 Glass and other translucent materials used in the canopy shall be non-splintering, e.g. laminated glass or polycarbonate. The canopy material shall not support combustion.

5.10 Automatic levelling system

5.10.1 Where an automatic levelling (platform height adjustment) system is provided this shall match the intended change in aircraft door sill height during loading/unloading operations. The automatic levelling system shall achieve performance level "a" according to EN ISO 13849-1:2008.

5.10.2 Automatic levelling sensors shall be designed to ensure detection of aircraft movement.

5.10.3 The automatic levelling system shall be designed to react to operational changes in aircraft door sill height either upwards or downwards.

5.10.4 The automatic levelling system shall initiate adjustment before door sill height change reaches 50 mm. Adjustment shall be by successive maximum increments of 50 mm, measured at the leading edge of the platform.

5.10.5 Adjustment speed shall not exceed 0,025 m/s.

5.10.6 Where the upper (main) platform is equipped with a second system in addition to the primary system specified above, this shall be able to prevent damage to the aircraft in the event of the primary system becoming inoperative due to unforeseen failure of any kind.

5.10.7 If the second system is activated, an audible device and/or visual warning beacon, which can be heard and/or seen from both sides and rear of the passenger stair and from the upper (main) platform, shall indicate that the primary system is inoperative.

6 Information for use

6.1 Marking

Permanent marking of data shall consist of metal plates securely attached (e.g. riveted, welded) to the structure.

Markings shall include at least those markings required by EN 1915-1, and the additional markings in 6.2.

6.2 Warnings

The following warnings shall be affixed permanently at prominent positions, preferably by using pictograms:

a) Keep clear from moving parts;

b) Keep clear from stabilisers;

c) Keep clear from unpropped body during maintenance.

In addition, warning against the risk of falling shall be materialised by the graphic symbol of EN 1915-1:2013, Annex G, at least 200 mm high, located and readily visible on both sides of the upper (main) platform barrier (see EN 1915-1:2013, 5.13.2.6).

6.3 Instructions

Operating and maintenance instructions shall be supplied with each passenger stair. They shall generally meet the requirements of EN 1915-1:2013, 6.2. In addition, the operating and maintenance instructions shall contain depending on type and design of the stair:

a) the door sill heights and/or types of aircraft the passenger stair is able to match;

b) information about the positioning and adjustment of the passenger stair at the aircraft including the need to minimise gaps while controlling the adjustment to the aircraft and procedures for adjusting side guarding when opening or closing doors;

c) information about the use of the barrier devices (see 5.2);

d) routine checks to be carried out by the operator;

e) minimum training programme for the operator;

f) information about optional equipment, e.g. canopy, automatic levelling system;

g) information about lashing points and transportation facilities;

h) information about the measures to be taken in case of emergency situations or breakdown;

i) information about the type of hoses used in hydraulic systems.

7 Verification of requirements

7.1 General

The verification of requirements shall be carried out in accordance with EN 1915-1:2013, Clause 7. See also details for verification in EN 1915-3 as relevant and EN 1915-4. The following shall be verified by functional tests:

a) ground clearance during movement (see 5.1.7);

b) visibility during positioning (see 5.1.8);

c) correct function of the barrier devices including interlocks (see 5.2);

d) stair flight and platform illumination (see 5.1.10);

e) handling of the bottom hinged step (see 5.3.5);

f) sliding panel activation (see 5.4.4);

g) height adjustment system (see 5.6.2);

h) operation of the positive fit safeguard (see 5.6.3);

i) controls, monitoring devices and displays (see 5.7);

j) auxiliary means for lowering and stabiliser control (see 5.8);

k) automatic levelling system (see 5.10);

l) brakes, steering, illumination and warning devices (see EN 1915-1).

7.2 Guard rails

The guard rails deflections (see 5.5.7) shall be verified in accordance with EN ISO 14122-3:2001, 8.2.

7.3 Barrier

The upper (main) platform barrier's (see 5.2) strength shall be verified. The following testing procedures shall be used:

A load F of 1 000 N is to be applied through a 100 mm $\times$ 100 mm rigid flat plate to the barrier's handrail horizontally and perpendicular to it, using the most unfavourable transverse location, at the height of 1 100 mm, then at intermediate (knee-rail) height. Under this load, the maximum deflection measured at any point of the handrail shall not exceed 180 mm. Markings shall include at least those markings required by EN 1915-1, and the additional markings in 6.2.

7.4 Platforms and steps

The platforms deflections shall be verified in accordance with EN 1915-2:2001+A1:2009, 5.2.2.3. The requirements of 5.4.7 shall be met.

The steps deflections shall be verified in accordance with 5.3.7 of this European standard.

Annex A
(normative)

List of hazards

Table A.1 — List of hazards

No	Hazards identified in Annex B & Table B.1 of EN ISO 12100:2010	Hazardous situations	Relevant clauses in this part of EN 12312
1	**Mechanical hazards**		
	General mechanical hazards	Unbalance due to energy of moving elements (dynamic forces)	5.1.1, 5.1.2
		Structural failure due to insufficient mechanical strength	5.1.1, 5.1.2, 5.3.7, 5.4.7, 5.6.1, 7.4
		Structure falling due to inappropriate safety devices	5.6.3
		Liquids and gases under pressure Vehicle tilting or overturn and instability due to wind Structural failure due to snow load	5.1.2
	Being run over due to machinery mobility	Collision or person run-over due to insufficient visibility	5.1.14
		Collision or person run-over due to horizontal movements of the vehicle	5.1.13, 5.1.14, 5.2.5
		Collision or person run-over due to missing or inappropriate warnings	5.2.5
	Being thrown	Driver or operator thrown or injured due to inadequate restraint	5.1.9 b), 5.1.12
		Operator thrown off the stair/platform due to horizontal movements of the vehicle	5.2.1, 5.2.3, 5.2.4, 5.2.5
	Crushing or shearing	Crushing or get stuck due to inappropriate handrail	5.5.2
		Crushing due to unintentional movements of elements	5.2.2, 5.9.1
	Impact	Hitting due to the inadequate pass line height	5.9.2
		Hitting due to the inadequate surfaces and or corners	5.5.3, 5.9.3
	Cutting	Cutting or severing due to splintering material	5.9.5
		Cutting or scratches due to sharp corners or edges	5.5.3
	Friction or abrasion	Friction or abrasion due to inappropriate surface	5.5.3, 5.5.4, 5.9.4
	Slipping or tripping	Slipping due to slippery walkway or standing position surface	5.1.6
		Slipping or tripping due to inappropriate inclination of walkways and/or work platforms	5.1.5, 5.3.3
		Tripping due to insufficient local lighting	5.1.10

No	Hazards identified in Annex B & Table B.1 of EN ISO 12100:2010	Hazardous situations	Relevant clauses in this part of EN 12312
		Tripping due to jerks in lifting / work platform movements	5.7.5
		Tripping due to irregular step increments	5.3.1, 5.3.2, 5.3.5, 5.6.2
		Tripping due to varying step increments at the door sill	5.10.1, 5.10.2, 5.10.3, 5.10.4, 5.10.6
		Tripping over extended stabilisers	5.6.4
	Falling from height	Falling from height due to absence of guard rails	5.1.9 a), 5.4.3, 5.4.4, 5.5.1
		Falling from height due to insufficient guard rails	5.4.3, 5.5.1, 5.5.5, 5.5.6, 5.5.7, 7.2
		Falling from height due to missing or insufficient safety barrier	5.2.1, 5.2.2, 5.2.3, 7.3
		Falling from heights due to inappropriate dimensions of walkways and working areas	5.4.1, 5.4.2, 5.4.5, 5.4.6
2	**Electrical hazards**		
	Burn, electrocution from arc or live parts	Contact of persons with live parts (direct or indirect contact)	5.1.1, 5.1.11
3	**Thermal hazards**		
	Objects or materials with high temperature	Burning by hot parts due to inadequate or insufficient cover	5.1.1
4	**Hazards generated by noise**		
	Loss of hearing, loss of awareness, accidents	Deafness, physiological disorders (e.g. loss of balance, loss of awareness), accidents due to interference with communication and to non-perception of auditory warning signals	5.1.1
5	**Hazards generated by vibration**		
	Neurological or osteo-articular disorder	Whole body vibration, particularly when combined with poor postures	5.1.1
		Seats inadequacy to protect from whole body vibration	5.1.1
6	**Hazards generated by radiation**		
7	**Hazards generated by materials or substances**		
8	**Ergonomic hazards**		
	Discomfort, musculo-skeletal disorder	Unhealthy postures or excessive effort	5.1.4, 5.2.2, 5.3.3, 5.3.4, 5.3.5, 5.4.4, 5.7.1
	Consequences of human error	Insufficient visibility from driving or operating position	5.1.8, 5.1.9 c), 5.1.14, 5.7.7
		Inadequate design, location or identification of	5.7.1, 5.7.2, 5.7.4,

No	Hazards identified in Annex B & Table B.1 of EN ISO 12100:2010	Hazardous situations	Relevant clauses in this part of EN 12312
		manual controls	5.8.2
		Inadequate design or location of visual display units	5.7.3, 5.10.7
		Inattention to risk of falling from height	5.2.2, 5.2.5, 6.2
		Misunderstanding of safety signs or markings	6.2
		Misunderstanding of manufacturer's instructions	6.3
	Visual fatigue	Inadequate local lighting	5.1.10, 5.7.7
9	**Hazards associated with the operating environment**		
	Structural damage	Structural damage due to inappropriate ground clearance	5.1.7
	Collision	Collision with other objects or person due to inappropriate dimensions	5.1.3, 5.1.8, 5.8.1
	Injury due to collision of vehicles	Hazards to persons from collision with other equipment on the ramp	5.1.8, 5.1.13, 5.1.14
10	**Combination of hazards**		
	Injuries or distressing situations from lifting equipment	Loss of balance due to unexpected movement and/or speed of lifting device	5.10.1, 5.10.2, 5.10.3, 5.10.4, 5.10.5, 5.10.6

Annex ZA
(informative)

Relationship between this European Standard and the Essential Requirements of EU Directive 2006/42/EC

This European Standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association to provide a means of conforming to Essential Requirements of the New Approach Directive 2006/42/EC on machinery.

Once this standard is cited in the Official Journal of the European Union under that Directive and has been implemented as a national standard in at least one Member State, compliance with the normative clauses of this standard (except 5.1.3, 5.5.4, 5.9.4) confers, within the limits of the scope of this standard, a presumption of conformity with the relevant Essential Requirements of that Directive and associated EFTA regulations.

WARNING — Other requirements and other EU Directives may be applicable to the product(s) falling within the scope of this standard.

Bibliography

— **International standards:**

[1] ISO 12056, *Aircraft — Self-propelled passenger stairs for large capacity aircraft — Functional requirements*

— **Society of Automotive Engineers (SAE) recommended practices[1]:**

[2] AIR 6133, *Design and safety criteria for passenger boarding stairways*

[3] AIR 1558, *Interface protective devices — Ground equipment to aircraft*

— **International Air Transport Association (IATA), Airport Handling Manual (AHM), Section 9[2]:**

[4] AHM 920, *Functional specification for self-propelled telescopic passenger stairs*[2]

[5] AHM 920, *Functional specification for towed passenger stairs*[2]

1) Society of Automotive Engineers (SAE), 400 Commonwealth Drive, Warrendale, PA 15096-0001, USA, www.sae.org.

2) Publications Assistant, International Air Transport Association, 800 Place Victoria, P.O Box 113, Montreal, Quebec, Canada, H4Z 1M1, www.iata.org.

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